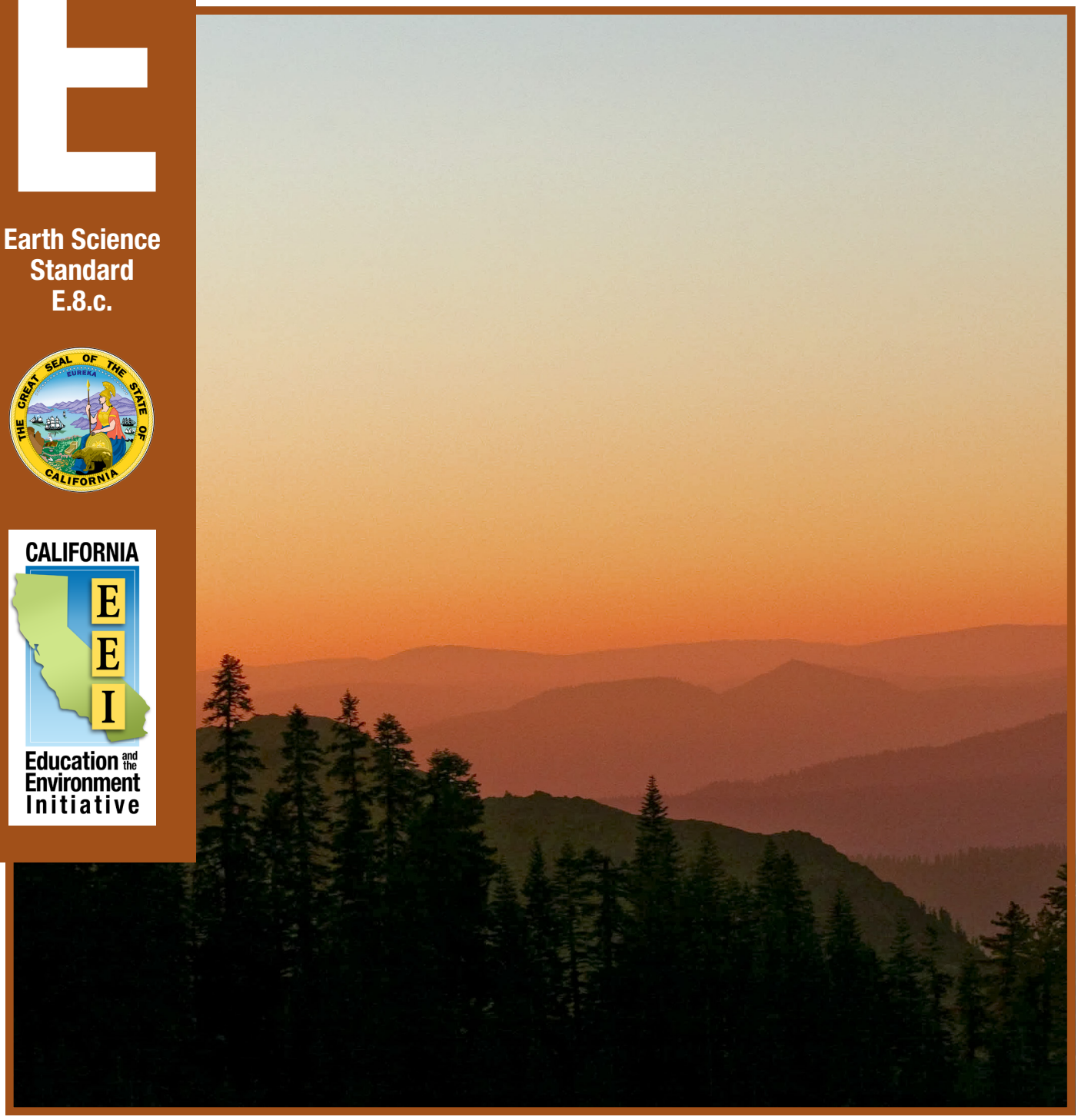
Teacher's Masters

California Education and the Environment Initiative

Earth Science Standard E.8.c.



Living Under One Roof

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency

California Natural Resources Agency

Office of the Secretary of Education

California State Board of Education

California Department of Education

California Integrated Waste Management Board

Key Leadership for the Education and Environment Initiative:

Linda Adams, Secretary, California Environmental Protection Agency

Patty Zwarts, Deputy Secretary for Policy and Legislation, California Environmental Protection Agency

Andrea Lewis, Assistant Secretary for Education and Quality Programs, California Environmental Protection Agency

Mark Leary, Executive Director, California Integrated Waste Management Board

Mindy Fox, Director, Office of Education and the Environment, California Integrated Waste Management Board

Key Partners:

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Office of Education and the Environment

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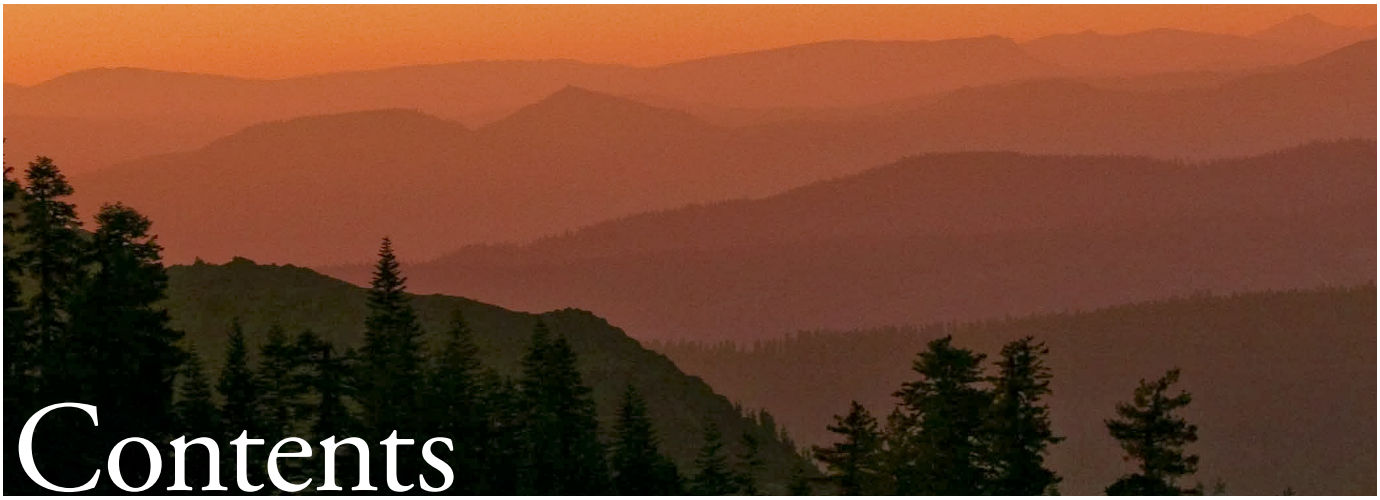
http://www.calepa.ca.gov/Education/EEI/



Contents

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Part 1

Instructions: Select the best answer and circle the correct letter. (2 points each)

1. The ozone layer blocks _____.
   a. most UV-B and UV-C radiation
   b. UV-A radiation
   c. ozone-depleting substances
   d. solar flares

2. Sunscreens _____.
   a. destroy ozone on your skin
   b. change the SPF of your skin
   c. keep UV radiation from entering your skin cells
   d. protect your skin from ozone

3. Ozone is made out of _____.
   a. three atoms of oxygen (O_3)
   b. UV radiation
   c. chlorine and bromine
   d. Both a and c.

4. Which of the following destroys ozone in the ozone layer?
   a. solar flares
   b. photosynthesis
   c. volcanic emissions
   d. Both a and c.

5. Which of the following products does not destroy ozone?
   a. fire extinguishers
   b. sunscreen
   c. aerosol sprays
   d. coolants

6. Without the ozone layer, Earth would most likely be _____.
   a. warmer
   b. lifeless
   c. darker
   d. a healthier environment for all living things

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7. When scientists first reported that CFCs destroy ozone, what happened?
   a. Amendments and adjustments were made to the Montreal Protocol.
   b. More products using CFCs were used.
   c. Alternatives to CFCs were developed.
   d. The Montreal Protocol immediately banned the production and use of CFCs.

8. Which of the following are human activities that cause changes to the ozone layer?
   a. driving gasoline-powered cars
   b. killing bacteria in swimming pools with chlorine
   c. using bromine gases in refrigerators, fire extinguishers, and sprays
   d. applying sunscreen

9. Scientists are unsure how certain living things on Earth are affected by changes to the ozone layer. Why are there still uncertainties about what a thinning ozone layer might mean to life on Earth?
   a. Some of our scientific research is not complete.
   b. We have not really seen any effects due to increased UV radiation.
   c. Scientists are not sure if we really need the ozone layer to protect us from UV radiation.
   d. Scientists cannot make measurements about temperature or atmospheric chemistry high in the atmosphere.

10. During winter months, stratospheric polar clouds form naturally over the poles. What is it about these clouds that cause the ozone layer to thin?
    a. These clouds block the Sun's radiation, preventing ozone production.
    b. The ice crystals in the clouds are a surface on which chlorine pollution can settle.
    c. These clouds develop mainly from volcanic emissions, which contain high amounts of chlorine gas.
    d. The clouds are the product of solar flares, or intense bursts of radiation from the Sun.

11. Which of the following accurately describes ozone chemistry in the stratosphere?
    a. Chlorine forms stable molecules with ozone.
    b. UV radiation contributes to both the production and destruction of ozone molecules.
    c. Ozone in the stratosphere has a different chemical structure than ozone in the troposphere.
    d. Ozone is created when two oxygen molecules (O_2) bond together.

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12. What is the role of chlorine and bromine in ozone destruction?
    a. These atoms bond to ozone molecules to make stable molecules.
    b. These atoms bond to oxygen atoms to make stable molecules.
    c. These gases prevent ozone destruction.
    d. These gases act as catalysts, increasing the rate of ozone destruction.

13. Which of the following is not an example of how science is helping people make decisions about using ODSs (ozone-depleting substances)?
    a. sharing information about natural events and human practices that produce ODSs
    b. tracking which countries are following the rules in the Montreal Protocol
    c. gathering data about how the ozone layer is changing
    d. developing new products and chemicals that do not use CFCs or HCFCs

14. Scientists are unsure exactly when the ozone layer will recover because _____.
    a. computer models are limited by the information we already have
    b. scientists are unsure how warmer surface temperatures may affect the stratosphere
    c. there may be factors that cause ozone destruction that they do not yet know about
    d. All of the above.

15. Which of the following is not the result of a thinning ozone layer?
    a. increased levels of UV radiation reaching Earth's surface
    b. cooling temperatures on Earth's surface
    c. the development of the UV Index
    d. the development of the Montreal Protocol

Part 2

Instructions: For each of the following questions, write a one-paragraph answer. Use a thesis statement and two or three supporting ideas in your answer. Include examples and data from the unit to support your answers. (20 points each)

16. Describe how science has been used to shape decisions, laws, and policies about the management of the ozone layer or ODSs.

_____

_____

_____

_____

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17. A thinning ozone layer affects human health, oceans, and food crops on Earth in a variety of ways. Describe how changes to the ozone layer can affect individuals and human communities.

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During this unit, you have learned about the ozone layer: where it is within Earth's atmosphere, its role in absorbing UV radiation, and how natural events and human activities can cause the ozone layer to change. You also learned that scientists are unsure about all the ways that a changing ozone layer might affect life on Earth. Even though our scientific knowledge is limited, what we know can help us make decisions about the ozone layer.

Instructions: Your assignment is to inform the public (in this case, your high school) about the importance of the ozone layer to human communities and natural systems on Earth. To do this, you may choose from two options:

- Develop an informational poster or brochure
- Develop an audio- or video-recorded, three-minute public service announcement (PSA) (including a written script)

You are responsible for submitting your own poster, brochure, or recording of a public service announcement (PSA). If you choose to record a PSA, you must also submit your own script, but you may work with a partner to complete the recording. Partners are responsible for working together effectively. You will have two class periods in which to complete your project.

Your project should present the following information, either in written form (words) or visual form (graphics, tables, photos, or other visual imagery):

- role of the ozone layer in absorbing UV radiation
- significance of the ozone layer to humans and other organisms
- significance of the ozone layer to human economies and communities
- how natural systems can affect Earth's ozone layer
- how human activities can affect Earth's ozone layer
- use of scientific knowledge in policy and management decisions
- factors that limit knowledge about the ozone layer and its effects on natural systems

Use the **Ozone Layer PSA, Poster, or Brochure Scoring Tool** on page 2 to guide your writing.

You PSA, poster, or brochure is due on: _____.

Name: _____

Ozone Layer PSA, Poster, or Brochure Scoring Tool

Component	4 points	3 points	2 points	1 point
Role of the ozone layer in absorbing UV radiation	Identifies the role of the ozone layer in absorbing UV radiation, with complete detailed explanation.	Identifies the role of the ozone layer in absorbing UV radiation, partially explained with details.	Identifies the role of the ozone layer in absorbing UV radiation, but lacks sufficient detail or explanation.	Identifies the role of the ozone layer in absorbing UV radiation, but does not explain in any detail.
Significance of the ozone layer to humans and other organisms	Identifies the significance of the ozone layer to humans and other organisms, with complete detailed explanation.	Identifies the significance of the ozone layer to humans and other organisms, but only partially explains with details.	Identifies the significance of the ozone layer to humans or other organisms, but lacks sufficient detail or explanation.	Identifies the significance of the ozone layer to humans and other organisms, but does not explain in any detail.
Significance of the ozone layer to human economies and communities	Identifies the significance of the ozone layer to human economies and communities, with complete detailed explanation.	Identifies the significance of the ozone layer to human economies and communities, but only partially explains with details.	Identifies the significance of the ozone layer to human economies or communities, but lacks sufficient detail or explanation.	Identifies the significance of the ozone layer to human economies and communities, but does not explain in any detail.

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Component	4 points	3 points	2 points	1 point
How natural systems can affect Earth's ozone layer	Provides examples of how natural systems can affect Earth's ozone layer, with complete detailed explanation.	Provides examples of how natural systems can affect Earth's ozone layer, but only partially explains with details.	Provides examples of how natural systems can affect Earth's ozone layer, but lacks sufficient detail or explanation.	Mentions an example of how natural systems can affect Earth's ozone layer, but does not explain in any detail.
How human activities can affect Earth's ozone layer	Describes how human activities can affect Earth's ozone layer, with complete detailed explanation.	Describes how human activities can affect Earth's ozone layer, but only partially explains with details.	Describes how human activities can affect Earth's ozone layer, but lacks sufficient detail or explanation.	Mentions how human activities can affect Earth's ozone layer, but does not explain in any detail.
Use of scientific knowledge in policy and management decisions about the ozone layer	Describes how scientific knowledge is used in making policy and management decisions about the ozone layer, with complete detailed explanation.	Describes how scientific knowledge is used in making policy and management decisions about the ozone layer, but only partially explains with details.	Describes how scientific knowledge is used in making policy or management decisions about the ozone layer, but lacks sufficient detail or explanation.	Mentions how scientific knowledge is used in making policy or management decisions about the ozone layer, but does not explain in any detail.

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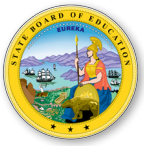
Component	4 points	3 points	2 points	1 point
Factors that limit knowledge about the ozone layer and its effects on natural systems	Describes factors that limit knowledge about the ozone layer and its effects on natural systems, with complete detailed explanation.	Describes factors that limit knowledge about the ozone layer and its effects on natural systems, but only partially explains with details.	Describes factors that limit knowledge about the ozone layer and its effects on natural systems, but lacks sufficient detail or explanation.	Mentions factors that limit knowledge about the ozone layer and its effects on natural systems, but does not explain in any detail.

Total Score: _____

Comments: _____



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